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DEPARTMENT OF THE NAVY
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REVISED
STORM DRAIN INFILTRATION STUDY APPROACH
PARCEL B

HUNTERS POINT SHIPYARD
SAN FRANCISCO, CALIFORNIA

November 30, 1998

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DRAFT STORM DRAIN INFILTRATION STUDY PARCEL B, DATED 24 APRIL 1998

REVISED STORM DRAIN INFILTRATION STUDY APPROACH PARCEL B

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REVISED INFILTRATION STUDY APPROACH PARCEL B
HUNTERS POINT SHIPYARD

This document presents the proposed approach for a revised storm drain infiltration study to address data gaps identified in the sampling and analysis plan (SAP) for Parcel B at Hunters Point Shipyard (HPS) in San Francisco, California. The purpose of the revised storm drain infiltration study is to determine whether contaminated groundwater is infiltrating into the storm drain system and, if so, what impact it will have on the water quality of the San Francisco Bay. The results of this study will be used to determine whether remedial action may be required and, if so, what sections of the storm drain system may require remedial action.

1.0 BACKGROUND

During the performance of the Parcel B remedial investigation (RI), data gaps, tasks to address them, and additional work required to support remedial design were identified by the Navy, regulatory agencies, and the project team. The Navy prepared a Parcel B SAP (PRC Environmental Management, Inc. [PRC] 1997) that was designed to supplement and refine existing geologic, geochemical, hydrogeologic, and chemical data and to better quantify the vertical and lateral extent of contaminants in soil and groundwater at the HPS Parcel B. One of the data needs identified in the draft-final Parcel B RI report and addressed by the SAP consists of conducting an infiltration study of the storm drain system to assess the potential for contaminated groundwater to migrate into and through the system and discharge into San Francisco Bay.

Following review of the SAP and responding to the regulatory agencies' comments, an infiltration study of the storm drain system was conducted in October 1997. The results of the infiltration study were reported in the infiltration study technical memorandum, "Infiltration Study Results at Parcel B" (Tetra Tech EM Inc. [TtEMI] 1998). Comments from the regulatory agencies on that technical memorandum and the Navy's responses are included in Appendix A to this document. The agency's comments and the Navy's responses are incorporated in this revised infiltration study approach.

2.0 REVISED INFILTRATION STUDY APPROACH

The revised infiltration study approach is described in the following: (1) objectives, (2) assumptions, (3) approach, and (4) data evaluation. All field activities will be conducted according to the procedures described in the quality assurance project plan (QAPjP) (PRC 1996), the HPS facility-wide health and safety plan (PRC 1996b), and TtEMI standard operating procedures. Quality assurance and quality control (QA/QC) procedures that will be performed during the infiltration study included field equipment decontamination; calibration of field and laboratory equipment; data reduction, validation and reporting; and analysis of field and laboratory QA/QC samples as described in the QAPjP (PRC 1996a). Storm drain water samples will be collected for chemical analyses and analyzed by a Navy- and California-certified laboratory.

2.1 OBJECTIVES

The objectives of the revised storm drain infiltration study are as follows:

- Assess whether contaminated groundwater is infiltrating into the section of line being tested
- Assess whether the infiltrating groundwater is impacting the water quality of San Francisco Bay
- Assess whether there is a probability of preferential flow of contaminated groundwater along the outside of the storm drain section being tested
- If infiltrating groundwater is impacting the water quality of the Bay, identify the sections of the storm strain system in Parcel B that may require remedial action

2.2 ASSUMPTIONS

The revised storm drain infiltration study assumptions are summarized as follows:

- Groundwater infiltration into the storm drain can only occur in those areas where the storm drain is below the groundwater table (see Figure 1).
- The sediment has been removed or will be removed from the storm drain reaches to be studied before the study.
- If a storm drain reach is plugged off at all inlets and outlets and dewatered, any water that

infiltrates into the plugged storm drain is A-aquifer groundwater.

- If a storm drain reach is plugged off at all inlets and outlets and dewatered, the rate of infiltrated groundwater is at a maximum.

- The only connections to the storm drains reaches to be studied are other storm drains, catch basins, and manholes.

- The water flow upstream of the sealed-off sections is less than 2,000 gallons per minute, and the upstream water can be discharged directly to the Bay.

- There is access to the sewer lines from all manholes and catch basins within the study area.

2.3 APPROACH

The revised approach for Parcel B infiltration study at HPS is based on performing the study at low tide, during dry weather (no rain for 48 hours), and at the time of year when the groundwater is typically at its highest (March/April). Figure 2, "Infiltration Study Decision Path," depicts the methodology summarized in the following list. Data Quality Objectives are included in Appendix B to this document.

- Seal off sections of the storm drain system that are submerged below the groundwater table.

- Dewater those sealed-off sections of lines.

- Pump water flow upstream of the sealed off section to the San Francisco Bay.

- Video record the dewatered section of line to locate cracks in the line and areas where infiltration is occurring.

- Sample the groundwater that infiltrates into those dewatered storm drain sections at the downstream manhole (which is just upstream on the plug) for laboratory analysis as described in Section 3.2.3.3.1 of the QAPjP. Sampling personnel will lower a 1,000-mL glass beaker inside a polyethylene dipper with a 12-foot extension handle into the manholes to collect the sample. The sampling personnel will then raise the beaker to the surface and pour the sample into sample bottles. The glass beaker is used to prevent potential phthalate contamination of the samples from the polyethylene dipper. The beaker is held to the dipper by tying a piece of Teflon tubing around the beaker and then fitting the beaker into the dipper. The Teflon tubing occupies enough of the annular space between the beaker and the dipper to create a snug fit.

- Measure groundwater, if any, indicator parameters (salinity, temperature, pH, specific conductance) in storm drain reaches being tested, following the procedures described in Section 3.4.5.1 of the QAjPP.

- Measure groundwater indicator parameters (salinity, temperature, pH, specific conductance) in monitoring wells located in the immediate vicinity of the storm drain reaches being tested, following the procedures described in Section 3.4.5.1 of the QAjPP.

- Measure groundwater indicator parameters (salinity, temperature, pH, specific conductance) in monitoring wells adjacent to the storm drain and above the tidal influence zone, following the procedures described in Section 3.4.5.1 of the QAjPP.

- Measure Bay water indicator parameters (salinity, temperature, pH, specific conductance) at the time the storm drain and monitoring wells are sampled, following the procedures described in Section 3.4.5.1 of the QAjPP.

- Measure the rate of infiltration for the sealed off storm drain reach by measuring the change in height of water in the downstream manhole (which is just upstream on the plug) during a time interval. The inflow rate will be determined by calculating the volume of water that collects at the downstream plug and dividing by the time it took for the water to accumulate.

- Excavate one test pit next to the outside of the storm drain pipe and a second pit a lateral distance of 10 feet away, collect samples at each test pit for permeability testing. Test method for permeability will be ASTM D 5084. Test pits will be excavated about every 50 linear feet along the submerged reaches that are proposed for testing (plugging, dewatering, video recording, and sampling). Each test pit near the storm drain pipe will be backfilled with low permeability (about 10^{-7} centimeters per second) material to serve as a potential water-tight contaminant cut-off wall. To determine if there is a probability of preferential flow along the outside of the storm section being studied, the permeability of the soil next to the storm drain and the permeability of the soil 10 feet away from the storm drain will be compared.

The storm drain sections (see Figure 1) that will be sealed-off, dewatered, and sampled for chemical analyses are as follows:

Storm Drain Reach	**Infiltrated Groundwater Sample Analysis**	**Vicinity Monitoring Well[a]**
From MH A8 to MH A9	TDS, CLP Metals	IR07MWS-2 IR07MWP-1 IR07MWP-2 IR07MW20A1 IR07MW20A2 IR23MW14A
From MH B5-1 to MH B6	TDS, TPH-g TPH-d and TPH-mo	IR25MW16A
From MH B6 to MH B7	TDS, TPH-g TPH-d and TPH-mo	IR6MW45A
From MH B7 to MH B8	TDS, TPH-g TPH-d and TPH-mo	IR20MW06A
From MH B8 to MH B9	TDS, TPH-g TPH-d and TPH-mo	NONE

Notes:

a	Wells for measuring salinity, temperature, pH, specific conductance of the groundwater
CLP	Contract Laboratory Program
TDS	Total dissolved solids by U.S. Environmental Protection Agency (EPA) Method 160.1
TPH-d	Total petroleum hydrocarbons as diesel by CA Leaking Underground Fuel Tanks (LUFT) and EPA method 8015B
TPH-g	Total petroleum hydrocarbons as gasoline by CA LUFT and EPA method 8015B
TPH-mo	Total petroleum hydrocarbons as motor oil by CA LUFT and EPA method 8015B

2.4 DATA EVALUATION

To confirm that the water samples collected form each storm drain reach was from infiltrating groundwater, the indicator parameters for samples collected from the vicinity groundwater monitoring wells will be compared to the indicator parameters for water samples collected from within the storm drain reach. If there is a 50 percent difference in any individual indicator parameter, then an investigation of other water sources will be conducted.

The infiltrated groundwater analytical results will be evaluated using the Parcel B record of decision (ROD) groundwater monitoring trigger levels. If chemical concentrations of infiltrated groundwater are less than the ROD trigger levels, remedial action will not be required for that given section of line. If chemical concentrations of infiltrated groundwater exceed the ROD trigger levels, that given section of storm drain line will be lined and grouted or removed as possible options.

The permeability results will be evaluated to compare the results next to the storm sewer reach to that 10 feet away from the storm sewer. If the permeability of the soil next to the storm drain line is less than two order of magnitude greater than the permeability 10 feet away from the storm drain line, remedial action will not be required. If the permeability of the soil next to the storm is greater than two order of magnitude greater than the permeability 10 feet away from the storm drain line, remedial action will be investigated.

3.0 REFERENCES

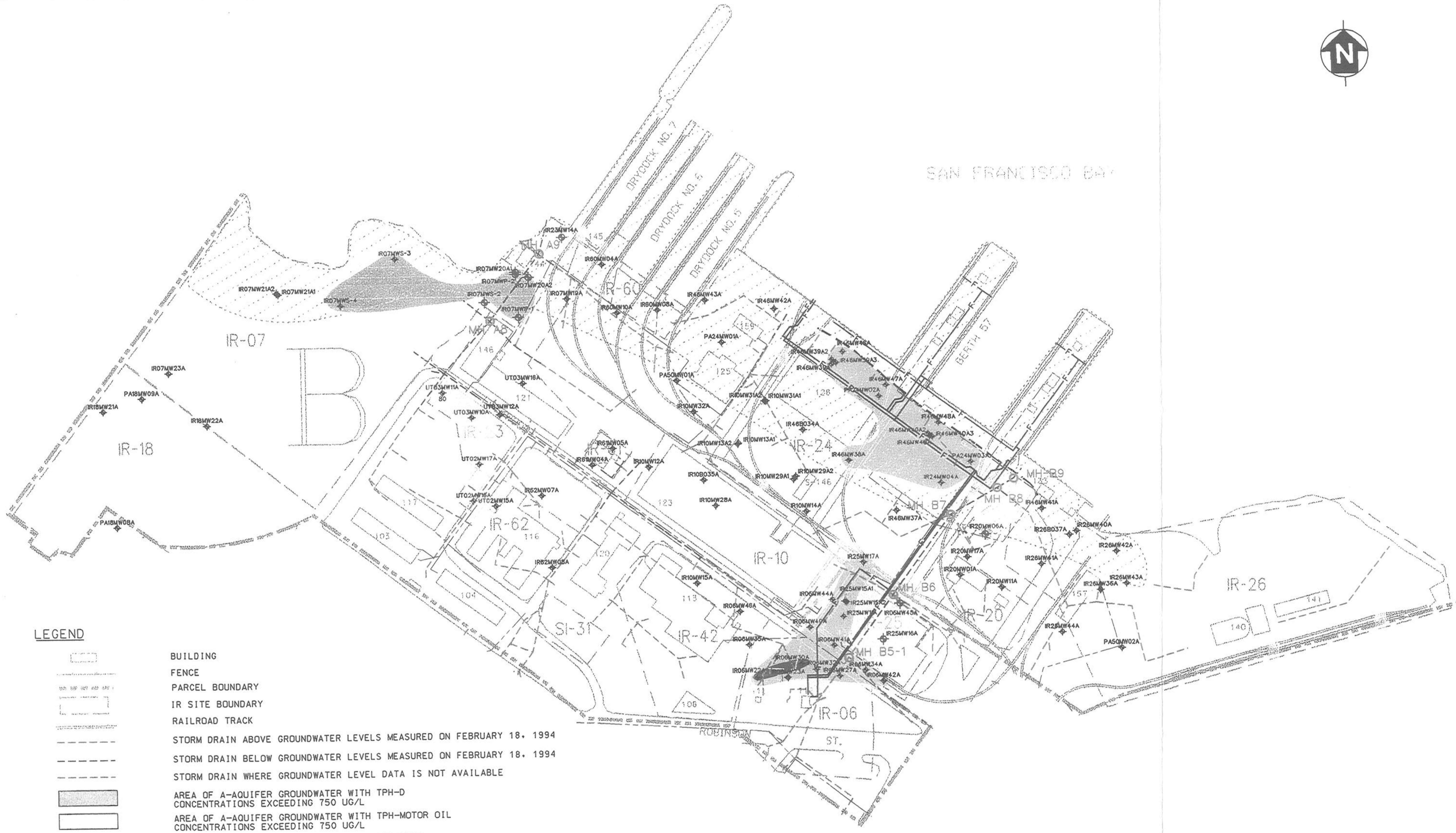
PRC Environmental Management, Inc. (PRC). 1996a. "Installation-Specific Quality Assurance Project Plan Elements Draft Final, Hunters Point Shipyard, San Francisco, California." May 24.

PRC. 1996b. "Basewide Health and Safety Plan. Hunters Point Shipyard, San Francisco, California." June 5.

PRC. 1997. "Data Gaps Sampling and Analysis Work Plan for Additions to the Scope of Work at Parcel B, Hunters Point Shipyard, San Francisco, California." July 9.

Tetra Tech EM,Inc. (TtEMI). 1998. "Draft Storm Drain Infiltration Study at Parcel B, Hunters Point Shipyard, San Francisco, California." April 24.

FIGURES



LEGEND

BUILDING

FENCE

PARCEL BOUNDARY

IR SITE BOUNDARY

RAILROAD TRACK

STORM DRAIN ABOVE GROUNDWATER LEVELS MEASURED ON FEBRUARY 18, 1994

STORM DRAIN BELOW GROUNDWATER LEVELS MEASURED ON FEBRUARY 18, 1994

STORM DRAIN WHERE GROUNDWATER LEVEL DATA IS NOT AVAILABLE

AREA OF A-AQUIFER GROUNDWATER WITH TPH-D CONCENTRATIONS EXCEEDING 750 UG/L

AREA OF A-AQUIFER GROUNDWATER WITH TPH-MOTOR OIL CONCENTRATIONS EXCEEDING 750 UG/L

AREA OF A-AQUIFER GROUNDWATER WITH ORGANICS CONCENTRATIONS EXCEEDING ROD CLEANUP GOALS

AREA OF A-AQUIFER GROUNDWATER WITH METALS CONCENTRATIONS EXCEEDING ROD CLEANUP GOALS

IR18MW22A — MONITORING WELL

IR23MW14A — STORM DRAIN VICINITY MONITORING WELL

MH A8 — MANHOLE

125 0 125 250

SCALE IN FEET

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND

ENGINEERING FIELD ACTIVITY WEST
SAN BRUNO, CALIFORNIA

HUNTERS POINT SHIPYARD — SAN FRANCISCO, CALIFORNIA

FIGURE 1
SUBMERGED STORM DRAIN LINES
PARCEL B SAMPLING AND ANALYSIS PLAN

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Insure that sediment has been removed from storm drain reach

Seal-off, dewater, and video record inside of storm drain reach

Does groundwater infiltrate into the storm drain reach?

Yes

No

Measure indicator parameters in bay water, storm drain reach, immediate vicinity monitoring wells, and monitoring well above the TIZ

Do the indicator parameters from within the storm drain reach and those in the immediate vicinity wells vary by greater than 50 percent?

Yes

No

Investigate for other sources of water flow into the storm drain section

Are there other sources of water flow into storm drain sections?

Yes

No

Can the other sources be sealed or shut off within the current budget allotted?

Yes

No

Seal or shut off other cources

Collect and analyze water and determine flow rate

Does infiltrated groundwater contaminant concentrations exceed Parcel B ROD groundwater clean-up goals?

Yes

No

Investigate remedial action on the storm drain reach

Excavate test pits along the storm drain reach and 10-feet away from the storm drain and collect soil sample at these locations to evaluate the storm drain backfill permeability in relationship to the permeability of the soil 10-feet from the storm drain

Does the soil next to the storm drain reach have a permeability less than two order of magnitude greater than the permeability of the soil 10-feet from the storm drain?

Yes

No further action required

No

Investigate remedial action on the storm drain reach

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND

ENGINEERING FIELD ACTIVITY WEST

HUNTERS POINT SHIPYARD — SAN FRANCISCO, CALIFORNIA

FIGURE 2
INFILTRATION STUDY DECISION PATH
PARCEL B

APPENDIX A

APPENDIX A
RESPONSE TO AGENCY COMMENTS ON THE DRAFT STORM DRAIN INFILTRATION STUDY AT PARCEL B HUNTERS POINT SHIPYARD

This document presents the U.S. Department of the Navy's (Navy) responses to comments from the regulatory agencies on the "Draft Storm Drain Infiltration Study at Parcel B for Hunters Point Shipyard (HPS)," dated April 24, 1998. The comments addressed below were received from the U.S. Environmental Protection Agency (EPA) on June 1, 1998; the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) on June 2, 1998; and the California Department of Toxic Substances Control (DTSC) on May 18, 1998.

Agency comments are presented in boldface type, and Navy responses are presented in normal type.

RESPONSE TO COMMENTS FROM EPA

General Comments

1. **Comment:** **The water samples collected for the infiltration study were taken from approximately two hours before to one hour after high tide in San Francisco Bay. The time between high and low tides is approximately six hours. The samples collected in the late fall (mid-October). Four of the six samples were taken in storm drains that are in the tidal influence zone (TIZ) and one more sample was collected from the edge of the zone. Figure 2-13 of the Parcel B Feasibility Study shows that in the TIZ water level changes in the monitoring wells (within 400 feet of the shoreline) of over four feet can occur between high and low tides. In this same report, seasonal water level changes in groundwater monitoring wells in the A-Aquifer are stated to range from 0.31 to 3 feet but are generally less than 2 feet, with groundwater levels lower in the summer and fall (Section 2.2.7, page 2-7). At high tide a reversed hydraulic gradient (inland from the bay) may occur locally (Section 3.8.3.1, page 3-24, Remedial Investigation, Parcel B, Draft Final Report, June 1996). These documents clearly show that there are temporal changes in the water levels in Parcel B groundwater near the bay, and demonstrate that there is interaction between the groundwater and tides in the bay. Because of these interactions, an assumed simple relationship between the groundwater and the bay with apparent up-stream and down-stream sampling points of groundwater contamination, and a one time sampling event is not sufficient to determine whether the storm drain lines serve as a preferential pathway for groundwater contamination to the bay.**

The greatest potential for the storm drain system at Parcel B to serve as a pathway of groundwater contamination to San Francisco Bay would be

when the groundwater levels were the highest and the level of the bay water the lowest. At this time, the induced gradient from the groundwater into the storm drains to the bay would be the highest. This is the exact opposite from when the samples were collected. Samples taken at high tide in the storm drains in the area of tidal influence could potentially be a mix of sea water, surface water, and infiltrating groundwater.

Response: The Navy is developing a revised infiltration study that will consider the issues raised in this comment. The study approach is submitted with this document.

2. **Comment:** **It is not apparent from the water analyses if these storm drain water samples were bay water or mixed groundwater and bay water, but the three samples taken in the TIZ (or on the edge of the TIZ) where there is data available to approximate the salinity of the water, had an average salinity of around 27,500 mg/L. The salinity of sea water is approximately 31,600 mg/L and the upper range of salinity of the A-Aquifer is 28,000, so the source of the water in these samples is not definitive; high salinity groundwater would normally be expected closer to the bay. However, sample IR50SWTB39, the upstream sample taken in Basin II, had an approximate salinity of 27,800 mg/L, but according to Figure 3.8-7 (Remedial Investigation, Parcel B, Draft Final Report) the total dissolved solids (TDS) of the A-aquifer groundwater in that area is between 12,000 and 14,000 mg/L. Since this is less than one-half of the salinity of the storm drain sample, and there are contributions to TDS in groundwater other than salinity, this sample was likely bay water. Also as a comparison, the sample taken at the upper reach of the storm drain in Basin IV (IR50SWTB26), which is not in the TIZ had a salinity of approximately 300 mg/L in an area with less than 2,000 TDS in groundwater (Figure 3.8-7, RI). Therefore, because of potential influence of sea water in the storm drain lines, the sampling results, as presented in the document, cannot be used to draw conclusions about the impact of groundwater infiltration in the storm drains and the potential impact to San Francisco Bay.**

Response: The comment is acknowledged and will be considered during the development of the revised infiltration study. The revised approach will involve plugging the storm drain at all entrances and exits to prevent inflow or outflow of water.

3. **Comment:** **The influence of sea water on the storm drains is normal for the near bay areas of Parcel B and the results, especially for the Basin III lines (IR50SWTB03 and 37) may not differ from the results presented in the document. In this area the lines were found to be submerged and could not be cleaned out (Field Summary Report, Storm Drain Removal Action, Hunters Point Shipyard, December 1997). Because of the consistently submerged lines, the gradient in this area between the groundwater and the bay is probably too low for the storm drain lines to serve as a significant preferential pathway for groundwater flow. However, without**

further sampling and additional sampling points this can not be conclusively demonstrated.

Response: The Navy agrees with the conclusions developed in this comment when related to flow along the outside of the storm drain. Any water flow (for example, runoff and infiltration) into the storm drain upstream of the Bay, however, will eventually flow into the Bay so that water level equilibrium can be maintained between the Bay and the water inside the drain. The Navy is designing a revised infiltration study that will determine whether there is infiltration of contaminated water into the storm drain and, if so, what impact it will have on the water quality of the Bay.

4. **Comment:** **There was not mention of the flowrate at each manhole. If the flowrate is high because of winter rain storms, the chemicals infiltrating into the storm drains would be diluted. The concentrations in the storm drains would be higher in the summer when the source of water in these storm drains are occasional runoff from the surface (i.e. washing sidewalk, etc) and infiltration from groundwater.**

Response: The flow rate was not determined during the infiltration study. The Navy is designing a revised study that will include determining infiltration flow rate.

5. **Comment:** **There is a significant length of storm drain where it is unknown if the storm drain is above or below the water table. This may explain why there were detections in "upstream" manholes.**

Response: Comment acknowledged.

6. **Comment:** **There was essentially no change in concentrations in samples between IR50SWTB39 (upstream) and IR50SWTB40 (downstream). However, a decrease in concentration could be expected if groundwater was not entering into the storm drains, because the increased flow from the other reaches of storm drains that feed into IR50SWTB40 would dilute the concentration.**

Response: See response to general comment 2 from EPA.

7. **Comment:** **Between IR50SWTB26 (upstream) and IR50SWTB12 (downstream), the concentrations decreased. This was probably due to the increased flow from the above groundwater storm drain lines that feed into the system between the upstream and downstream manholes.**

Response: See response to general comment 2 from EPA.

8. **Comment:** **There was a slight increase in TPH-diesel concentration between IR50SWTB37 and IR50SWTB03. Although, there were fewer lines feeding into the storm drain between these manholes, some dilution between manholes occurred because of the increased flow.**

Response: See response to general comment 2 from EPA.

9. **Comment:** **The purpose of this investigation as stated on page 1, is to assess the potential for groundwater to enter the storm drain system. However, the analysis performed compared the concentrations in the storm drains to water quality levels. The report concluded that because the concentrations were below the stated water quality levels, the groundwater did not impact water quality. There are two problems with this argument; first, the objective was to determine if groundwater has a potential for impacting the storm drains, not assessing the impact. The presence of chemicals in the storm drains that are also found in the groundwater, and the fact that the storm drains are below groundwater indicates a strong probability that groundwater is entering into the storm drains. Secondly, the concentrations in the storm drains during the heavy rain months, i.e. February, should be less than during the summer months. Therefore, a comparison between water quality levels and concentrations found in storm drains would only be useful if the objective is to determine how much contaminated groundwater is entering the storm drains, and if there is sufficient historic sampling from the storm drains.**

Response: The Navy is designing a revised infiltration study that will determine whether there is infiltration into the storm drains within the areas of concern. If it is determined that there is infiltration of contaminated water, the impact of this water on the water quality of the Bay will be evaluated.

10. **Comment:** **It is premature to eliminate lining and grouting the storm drains. In fact, based on this test, EPA would conclude that the storm drains need to be lined and grouted because it appears groundwater is getting into the storm drains.**

Response: The Navy is designing a revised study that will determine whether there is infiltration of groundwater into the storm drain. If there is infiltration into the storm drains, however, it does not necessarily mean that the storm drains should be lined and grouted. An evaluation of the impact the infiltration water on the Bay should be performed.

Specific Comments

1. **Comment:** **Section 3.2. Dilution of infiltrating groundwater with bay water pushed inland by the high tides is the most likely explanation for the finding that downstream concentrations were lower than upstream concentrations.**

Response: Comment acknowledged.

2. **Comment:** **Section 3.3. Because sampling was conducted at high tide, it is inappropriate to conclude that groundwater does not appear to be impacting the water quality in the storm drains.**

Response: See response to general comment 2 from EPA.

Recommendations

1. **Comment:** **As part of the infiltration study, as much data as practicable needs to be collected to determine the flow interactions of the groundwater, storm drains, and tidal fluctuations of the bay water. The following data collection needs are suggested:**

- **Review available data concerning the grade elevations of the storm drain lines with respect to bay level and tidal fluctuations.**
- **Add flowrate measurement to the list on page 6 and resample during a low flow period.**
- **Collect samples within from one hour before to two hours after the lowest tide of the day.**
- **Sample during late spring or early summer to take advantage of higher groundwater levels.**
- **Add sampling points in the storm drain system to get additional data outside of the tidally influenced zone (where feasible); for example, samples should be collected from locations with characteristics similar to:**
  - **MH A6, Basin II (33" line)**
  - **MH A3, Basin III (18" line)**
  - **MH B6, Basin IV (33" line)**
  - **MH B8-2, Basin IV (15" line)**
- **Add salinity and TDS to the list of analytes.**
- **Measure the salinity of bay water at approximately the same time samples were collected.**
- **If feasible, use a hand held, low-velocity flow meter to measure any flow in the storm drain lines and at the drain outfalls (if visible).**
- **During one sampling period, sample at both high and low tides, with indicator analytes, to evaluate changes in the water quality due to tidal fluctuations.**

Response: See response to general comment 2 from EPA, and revised approach.

RESPONSE TO COMMENTS FROM RWQCB

General Comments

1. **Comment:** **The study as implemented does not appear to have been adequate to satisfy the stated purpose of the study, i.e., to evaluate the potential infiltration of contaminated groundwater into the storm drain system and its impact on water quality in San Francisco Bay. In particular, the comparison of "upstream" sample results to results from samples collected at "downstream" stations during high tide periods is not appropriate. As a result, interpretations and conclusions based on the samples results are of extremely limited usefulness. Presentation of data as supporting a conclusion that groundwater does not appear to be affecting water quality in the storm drain system is misleading at best. In light of these limitations, the recommendation to redo the study seems appropriate, but would be conducted, in our view, to the end of developing a dataset that meets the original purposes of the study, not to verify the results presented in this study. Assessment of the extent of storm drain lining should await the completion of a study that meets the stated purposes of the study.**

   Response: See response to general comment 2 from EPA.

RESPONSE TO COMMENTS FROM DTSC

General Comments

1. **Comment:** **Three pairs of up-stream/down-stream samples were collected in storm drains to study whether sewer flow picks up significant infiltration from the surrounding contaminated groundwater plume and discharges it into the bay. However, four of the six samples were collected in the tidal influence zone (TIZ). The concerns for samples collected in the TIZ are:**

   (1) For Pair IR50WTB39/IR50SWTB40 and Pair IR50SWTB37/ IR50WTB03, the plume has already reached the bay. If slip-lining the storm drains is intended to protect the bay from the contaminants of the groundwater plume, it will not be effective at these locations.

   (2) For Pair IR50SWTB26/IR50SWTB12, if contaminants are detected, they may be related to the infiltration upstream and slip-lining is needed. But if contaminants are not detected, it may be the result of dilution by bay water infiltration through the section of line inside of the TIZ and further investigation of infiltration up gradient from the TIZ is still necessary.

   Response: See response to general comment 2 from EPA.

2. **Comment:** **It appears a revised sampling plan should focus on the sections of storm drains up gradient of the TIZ and identify areas where contaminated groundwater may come into contact with storm drains.**

Response: See response to general comment 2 from EPA.

3. **Comment:** **An alternative could be to identify all sewer lines that intersect the boundary of the TIZ and sample at the point of intersection where sewer lines are below the water table. Any detection above cleanup criteria as prescribed in the Parcel B ROD should be followed by back-tracking the lines to find their infiltration source. Previous studies from Storm Drain Sediment Removal Action should provide records and video tapes of the inside of storm drains and show where the lines are leaking.**

Response: See response to general comment 2 from EPA.

APPENDIX B

APPENDIX B

DATA QUALITY OBJECTIVES

Parcel B Revised Infiltration Study

This appendix discusses Data Quality Objectives (DQO) for the Parcel B revised storm drain infiltration study approach based on a seven-step DQO process designed by the United States Environmental Protection Agency (USEPA) (USEPA. 1994. "Guidance for the Data Quality Objectives Process for Superfund." EPA QA/G94. September), to aid in the development of data collection plans. The DQO process is a series of planning steps designed to ensure that the type, quantity, and quality of environmental data used in decision making are appropriate for the intended application. The process is designed specifically to prevent the collection of inconsequential data for the decision making process.

Decision making is improved because the DQO process provides a system for developing specific decision rules and an opportunity for all decision makers to contribute to the scheduled activity before data are collected. The members of the planning team are the Navy and TtEMI. Additional input to the investigation and the DQO process will be provided by the USEPA, California Environmental Protection Agency Department of Toxic Substances Control (DTSC), and the California Regional Water Quality Control Board (RWQCB).

The DQO process consists of the following seven steps:

1. **State the problem.** Clearly define the problem to be studied and gather information that provides additional insight to the problem.

2. **Identify the decision.** Determine what questions the study will attempt to answer.

3. **Identify inputs to the decision.** Identify what information needs to be obtained and what measurements need to be taken to resolve the decision statement.

4. **Define the study boundaries.** Specify the spatial and temporal aspects that apply to the decision statement.

5. **Develop a decision rule.** Specify the action level, and, together with previous DQO outputs, develop an if/than statement identifying the conditions for choosing alternative actions.

6. **Specify limits on decision errors.** Define decision error rates based on consideration of the consequences of making an incorrect decision.

7. **Optimize the design.** Identify the most resource-effective data collection design based on information obtained from the previous steps.

Results from DQO steps 1 through 7 for the Parcel B Revised Infiltration Study are discussed in sections 1 through 7, respectively.

1. State the Problem

There is a potential of contaminated groundwater infiltration into the storm drain that may impact the water quality of the bay. There is also a potential of a preferential pathway for contaminated groundwater flow along the outside of the storm drain which may impact the water quality of the bay.

2. Identify the Decision

Data collected though implementation of this revised storm drain infiltration study will confirm whether or not contaminated groundwater is entering the storm drain and if there is a groundwater preferential flow along the outside of the storm drain. If there is infiltration or groundwater preferential flow within or outside the storm drain, then it will be evaluated if the groundwater is impacting the water quality of the bay. If infiltrating contaminated groundwater or contaminated groundwater preferential flow is impacting the Bay then remedial action will be required.

3. Identify Inputs to the Decision

The following are inputs that will be used to decide if remedial action of storm drain sections located below the groundwater table is required:

- Video screening results of the interior of the storm drain reaches which are below the groundwater table.
- Analytical results of infiltrated groundwater, if present.
- Indicator parameters of infiltrated groundwater, if present.
- Indicator parameters of groundwater in immediate vicinity monitoring wells.
- Indicator parameters of groundwater in monitoring wells adjacent to the storm drain reach and above the tidal influence zone.
- Indicator parameters of Bay water.
- The rate of infiltration, if present
- Permeability test results of soil next to the outside of the storm drain reaches being studied.
- Permeability test results of soil a lateral distance of 10 feet away from the storm drain reach being studied.
- Parcel B ROD groundwater clean-up goals.

4. Define the Site Boundary

The study boundaries are limited to the storm drain sections which are below the groundwater table and which are located within contaminated areas (refer to Figure 1 located in the main document to this appendix).

5. Develop the Decision Rule

Refer to Figure 2, "Infiltration Study Decision Path," located in main document to this appendix.

6. Specify Limits on Decision Errors

Because of the use of multiple lines of evidence or decision rules, which will be considered in a weight-of-evidence approach, a single error rate has not been assigned for the decisions. Generally, the intent will be to minimize the probability of making either false positive or false negative types of errors. Minimizing these errors requires collection of an adequate amount of data of sufficient quality to support the decisions. Chemical measurement objectives for data quality consist of the precision, accuracy, representativeness, completeness, and comparability (PARCC) criteria; the PARCC criteria are discussed in the Hunters Point Shipyard (HPS) Basewide Quality Assurance Project Plan (PRC Environmental Management, Inc. 1996, "Installation-Specific Quality Assurance Project Plan Elements Draft Final, HPS, San Francisco, California." May 24). The precision and accuracy objectives for water samples are as specified in Table 1 below. The precision objectives for field measurements will be compared to the established RPD acceptance criteria of +/- 25 percent. The completeness objective for field samples is 90 percent for the project. Representativeness and comparability are qualitative parameters and are described in the above referenced document.

Table 1 - Matrix Spike Recovery, Relative Percent Difference (RPD), and Surrogate Recovery Control Limits

Analysis	Method	Matrix Spike % Recovery	RPD	Surrogates % Recovery
Total Petroleum Hydrocarbons-Purgeable	CA LUFT & EPA 8015B	70-130	30[a]	75-125
Total Petroleum Hydrocarbons-Extractable	CA LUFT & EPA 8015B	50-150	50[a]	60-140
Metals	Contract Laboratory Program (CLP)	75-125	20[b]	NA
TDS	EPA 160.1	NA	20[b]	NA

a RPD is between matrix spike and matrix spike duplicate recoveries
b RPD is between sample and duplicate sample results

7. Optimize the Design

The optimum design is presented in the "Revised Storm Drain Infiltration Study Approach," which is submitted as the main document to this appendix. The optimized design for the revised storm drain infiltration study was based on the results of the previous storm drain study and on agency comments.